

C-A OPERATIONS PROCEDURES MANUAL

9.1.9 Fault Study Procedure for Primary and Secondary Areas

1. Purpose

- 1.1 To provide instructions to Radiation Safety Committee (RSC) representatives, liaison physicists and Main Control Room (MCR) operations staff for conducting fault studies in primary and secondary beam areas.
- 1.2 Definitions
 - 1.2.1 RSC representative - An RSC member or other knowledgeable person (e.g. liaison physicist (appointed by Division Head) assigned by the RSC to follow this procedure during the fault study.
 - 1.2.2 Chipmunk bypass - Changing the state of a chipmunk from interlock to non-interlock mode via a local switch setting on the unit; **NOT** an interlock bypass as defined in [C-A-OPM 4.92](#). RSC review is required and equivalent administrative controls must be in place.

2. Responsibilities

- 2.1 *Primary areas:* MCR Operations staff, RSC representative and Radiological Control Technician (RCT)/Facility Support (FS) Representative.
- 2.2 *Secondary areas:* [Liaison Physicist](#) and RCT.

3. Prerequisites

- 3.1 Start of study: A specific Fault Study Plan (FSP) must be defined by a person knowledgeable in the beam properties in the area. This outline must be reviewed and approved by the RSC.
- 3.2 Additional items as defined in each FSP.
- 3.3 End of study: return to routine operating mode for the accelerator.
- 3.4 Qualified and trained RSC representatives, MCR operations staff, [Liaison Physicist](#) and RCT.
- 3.5 If personnel other than a qualified RCT are to assist with the pulsed radiation surveys during the fault study, they must read [C-A-OPM-ATT 9.1.9.c](#) and the RCT must verify their ability to use the instrument.

4. **Precautions**

- 4.1 Beam fault studies are to be conducted using the minimum beam intensity necessary to complete the study efficiently and consistent with ALARA practices. Any fault study requiring higher intensity than 10% of normal operating intensity must be reviewed and approved by the RSC.
- 4.2 Beam not lost at the intended location(s) for the fault study should be safely aborted (if possible) at target stations, beam dumps or other acceptable locations.
- 4.3 Area announcements over the PA must be made prior to initiating the fault condition and when the fault study is completed.
- 4.4 The beam should be "ON" in the fault condition only as long as necessary for adequate survey measurements to be taken.
- 4.5 Data for the fault study must be entered in the designated fault study logbook for the area (eg. Booster, AGS, SEB area, etc.).
- 4.6 The vicinity of the fault study (including other beam loss locations) should be posted with RCD TECHNICIAN signs and tape where appropriate.

5. **Procedure**

FAULT STUDY N°. _____.

- 5.1 The logbook recorder should be familiar with details of this procedure and the fault study plan.

_____. logbook recorder

- 5.2 A copy of the Fault Study Plan (FSP) must be given to MCR and the duty RCT prior to the start of the fault study.

_____. RSC representative

- 5.3 From the dose rate estimate(s) provided in the Fault Study Plan, the survey team must be informed of the expected exposures during the study so they can determine whether it is appropriate for them to participate based on their accumulated dose. These estimates should also be used to determine if a Radiation Work Permit should be issued for the study.

_____. MCR Operations Coordinator

- 5.4 If any modifications to the Access Control System (ACS) or Particle Accelerator Safety System (PASS) have been made in order to conduct this fault study, note the date and time of the modification(s). [Chipmunk bypass recorded here].

_____date. _____time. logbook recorder

- 5.5 When the desired normal (non-fault) operating conditions have been established, record the date and time below.

_____date. _____time. logbook recorder

- 5.6 The non-fault conditions must be documented in the logbook for the fault study. Note: Previous documentation may be used (referred to) if accelerator/area conditions have not changed. logbook recorder

Parameter file saved or listed. _____ logbook recorder

Beam intensity (primary and/or secondary) including experiment beam counters if appropriate. _____ logbook recorder

- 5.7 Before the fault conditions can be established, the appropriate locations for the desired fault study have been swept, and where necessary, posted with HP tape, signs, etc.

_____. Health Physics

- 5.8 An announcement must be made prior to beginning the fault studies, "Attention all personnel in the (Linac, Booster, AGS, SEB, etc.) areas, fault studies are now in progress. Please remain clear of all posted areas until further notice".

_____. logbook recorder.

- 5.9 The fault conditions may now be established. The start date and time should be entered below.

_____date. _____time. logbook recorder

- 5.10 The fault conditions must be documented in the logbook for the fault study. logbook recorder

Parameter file saved or listed, (or difference file). _____ logbook recorder

Beam loss conditions in the area documented. _____ logbook recorder

Beam intensity (primary and/or secondary), including experiment beam counters if appropriate. _____ logbook recorder

_____. completed RCD Technician survey.

- 5.11 From 5.4, if any modifications to the ACS and/or PASS were made in order to conduct this fault study, the ACS and/or PASS must be restored to the original state. [Chipmunk mode restored to original state recorded here].

_____date. _____time. logbook recorder

- 5.12 Date and time of the completion of the fault study.

_____date. _____time. logbook recorder

- 5.13 An announcement must be made over the PA following the end of the fault studies, "Attention all personnel in the (Linac, Booster, AGS, SEB, etc.) areas, beam fault studies have now been completed. Please resume normal activities and observe all posted areas".

_____. logbook recorder

- 5.14 The RSC Chair must review the fault study within a reasonable period of time to determine if changes to the shielding and/or area access control requirements are necessary on the basis of these measurements. Complete the following questions and fill in the following table:

- Intensity used in the fault study _____.
- Normal (N) _____and maximum Fault (F)_____intensity.
- Was the loss distribution sufficient for a review to determine whether the radiation protection is suitable for the area? _____(yes or no). (Refer to [C-A-OPM 9.1.11](#))

Area of Interest (e.g., northwest corner of Bldg. 930)	Measured Radiation Levels, mrem/h mrem/h	Extrapolated normal running and/or fault radiation levels (indicate if normal (n) or fault (f)) mrem/h	Indicate if the Area is an Uncontrolled, Designation, Shielding or Radiation, High Interlocks Deemed Necessary Radiation, Very by the Fault Study. Indicate High Radiation or Any Restrictions on Intensity High Hazard <u>Radiation Area</u>

Signature of the RSC representative _____

6. **Documentation**

- 6.1 The Radiation Safety Representative shall ensure that the completed procedure and other documentation are filed in the appropriate Fault Study Logbook.
- 6.2 The MCR Operations Coordinator shall note in the C-A MCR Coordinators Logbook that primary beam fault studies took place.
- 6.3 The Fault Study Plan (FSP) for the study.
- 6.4 Area survey maps (Health Physics).

7. **References**

- 7.1 FS-CA0-156, "Operation of the HPI-1010 & HPI-1030 Radiation Survey Instruments"
- 7.2 [C-A-OPM 9.1.11 "Guidelines for Radiological Controlled Area Classification and Radiation Access Control System Application"](#).
- 7.3 [C-A-OPM 4.92 "Control of Temporary Hardware Changes/Bypasses in the Particle Accelerator Safety System \(PASS\) and the Access Control System \(ACS\)"](#).

8. Attachments

- 8.1 [C-A-OPM-ATT 9.1.9.a, "Guidelines as to When Beam Fault Studies Must Be Done or Previous Study Data Reviewed".](#)
- 8.2 [C-A-OPM-ATT 9.1.9.b, "Procedures for Entering and Maintaining Data in Beam Fault Studies Logbooks".](#)
- 8.3 [C-A-OPM-ATT 9.1.9.c, "Guide to preparing a Fault Study Plan \(FSP\)."](#)